CDC's National Biomonitoring Program

DIVISION OF LABORATORY SCIENCES, NATIONAL CENTER FOR ENVIRONMENTAL HEALTH

CDC uses biomonitoring – laboratory measurements in blood, urine, and saliva – to regularly assess harmful chemical exposures and evaluate nutrition levels in the U.S. population.

The National Biomonitoring Program in the Division of Laboratory Sciences at the National Center for Environmental Health works to

- Develop unique, high-quality laboratory tests for hundreds of environmental chemicals and nutrition indicators
- Regularly assess exposure to environmental chemicals and nutrition indicators in the U.S. population
- Fund, train, and provide quality assurance materials to state-based biomonitoring programs and global micronutrient survey programs
- Collaborate on studies of environmental chemical exposures and nutrition on human health, and
- Provide laboratory support for emergency investigations of chemical or radionuclide exposures.

Mission: To provide laboratory science that improves the detection, diagnosis, treatment, and prevention of diseases resulting from harmful exposures and imbalanced nutrition.

The Most Comprehensive Assessments of Exposure to Environmental Chemicals and Nutrition Status in the U.S.

For more than 20 years, CDC has conducted biomonitoring of participants in the National Health and Nutrition Examination Survey, a nationally representative sample of the U.S. population collected every two years. CDC measures nutrition indicators of public health concern and environmental chemicals known or suspected to cause cancer, reproductive dysfunction, and respiratory, neurological, endocrine, immunologic, heart or renal diseases. The resulting data are available through the periodically updated National Report on Human Exposure to Environment Chemicals and Updated Tables and the National Report on Biochemical Indicators of Diet and Nutrition in the U.S. Population. By tracking chemicals and nutrition indicators over time, these reports help identify at-risk population groups and assess the success of public health actions to improve health.

BY THE NUMBERS

>400 environmental chemical biomarkers and **>80 nutrition indicators** measured by CDC experts

>500 public health laboratories receiving quality assurance materials from CDC to help ensure high quality and accurate biomonitoring measurements

>75 studies each year of environmental chemicals or nutrition biomarkers and health outcomes, in collaboration with academic, federal, state, and private partners

6 states collectively receiving about $5 million in grant funding each year from 2019-2024 to conduct high-quality biomonitoring science and assess exposures of concern in their communities

300 mass spectrometers in the world's largest, state-of-the-art public health laboratory

10 CDC quality assurance programs for environmental chemicals and nutrition indicators:

1. Lead and Multielement Proficiency Testing Program
2. Proficiency in Arsenic Speciation
3. Ensuring the Quality of Iodine Procedures
4. Biomonitoring Quality Assurance Program for State Biomonitoring Cooperative Agreement Recipients
5. Vitamin A Laboratory-External Quality Assurance
6. Vitamin D Standardization Certification Program
7. Quality Control Materials for Serum or Whole Blood Folate
8. Performance Verification Program for the Folate Microbiologic Assay
9. Quality Control Materials for Serum Micronutrients
10. Performance Verification Program for Serum Micronutrients

CDC's Biomonitoring Expertise and Data Improve Public Health

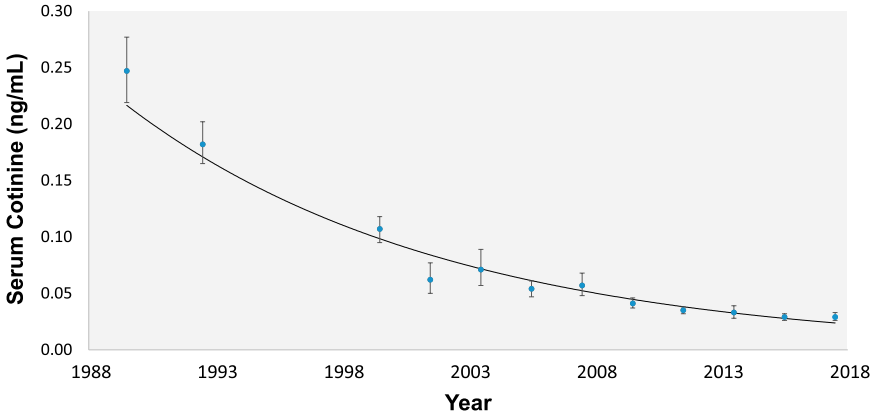
Informing regulations and interventions that prevent harmful exposures

CDC's nationally representative data help public health officials monitor trends over time and take action to prevent harm. For example, CDC's blood lead data were a major factor in removing lead from gasoline in the 1970s and 1980s. More recently, CDC's data arethe basis for the national blood lead reference value, which is used to identify children with higher levels of lead and initiate follow up to reduce their exposure.

Showing success in reducing non-smokers' exposure to secondhand smoke

CDC's data on cotinine - a marker of nicotine exposure - revealed that 88% of non-smoking Americans were exposed to tobacco smoke in the early 1990s. This finding prompted smoking restrictions in public buildings. Ongoing measurements by CDC found these actions dramatically reduced secondhand smoke exposure. They also help target new efforts to reduce exposure by identifying nonsmoker groups who are still exposed, including children.

Cotinine Concentration in Serum Among Nonsmokers With Secondhand Smoke Exposure, NHANES 1988-2018



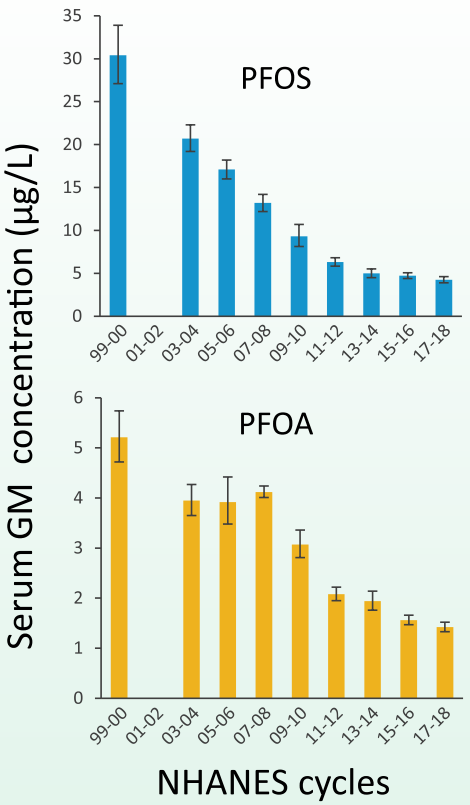
Supporting emergency investigations of chemical exposures

CDC supports investigations of suspected chemical exposures by providing technical expertise and testing for partners, including state health departments. For example, in response to an outbreak of electronic cigarette, or vaping, product use-associated lung injury (EVALI), CDC rapidly developed and applied 22 laboratory tests for measuring potential toxicants in product emissions and lung fluid specimens from patients. CDC's analysis established a strong link between vitamin E acetate and EVALI, prompting swift action by regulators, law enforcement, and public health officials to end the outbreak.

Improving assessments of folate status worldwide

Using a more accurate laboratory test, CDC showed that folic acid fortification, a public health intervention to reduce neural tube defects, successfully decreased folate deficiency to less than 1% among Americans, including among women of childbearing age. CDC also provides hands-on and video trainings that help scientists in low resource settings accurately perform folate tests, improving folate evaluations around the globe.

Temporal Trends: Long Alkyl Chain PFAS



Demonstrating the effectiveness of actions to reduce exposure

Per-and polyfluoroalkyl are a group of chemicals used to make many consumer products (e.g. clothing, cookware, food packaging) heat-resistant, non-stick, and stain-free. Since 2002, production and use of some PFAS in the United States have declined. **CDC measurements show a corresponding decline in long alkyl chain PFAS,** including perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorohexane sulfonic acid (PFHxS), in people. For example, PFOS decreased by more than 80% after U.S. manufacturers voluntarily ended production.

https://www.cdc.gov/biomonitoring